MODELING OF ENERGY SYSTEM DEVELOPMENT IN LATVIA: INTRODUCTION OF RES AND CLIMATE POLICY ISSUES IN ENERGY PLANNING MODEL

Gaidis KLAVS, Janis REKIS, Ilze PRIEDITE-RAZGALE
Institute of Physical Energetics, Aizkraukles iela 21, LV-1006, Riga, Latvia
ilze.priedite.razgale@gmail.com

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(1) Overview

The ambitious renewable energy policy of the European Union has stimulated an unanticipated increase of renewable electricity generation capacities. EU energy policy in terms of emission reduction is currently outlined until 2050 – effective participation of the EU Member States in defining possible directions of the EU energy policy requires clarity for each Member State of its own national energy policy plans and targets. The main targets of energy policy development in Latvia are included in our single long term policy planning document - Sustainable Development Strategy of Latvia until 2030. Sustainable Development Strategy of Latvia until 2030 sets a target of a 50% share of energy from renewable sources in gross final energy consumption in 2030, the achievement of which will be ensured by increasing the share of renewable energy in heating, electricity and transport sectors.

In order to analyse the RES employment and GHG emission reduction set of scenarios were performed. The effectiveness of various technologies and policies for reducing GHG emissions were investigated.

In order to evaluate economic and environmental benefits and losses in developed scenarios MARKAL-LV model is used.

(2) Methods

The analyses was performed using optimisation model MARKAL-LV, which is based on widely applied MARKAL (acronym for MARKet ALlocation) model developed by the Energy Technology Systems Analysis Programme (ETSAP) of the International Energy Agency (IEA) (ETSAP, 2001). The main paradigms of the model are competitive partial equilibrium and perfect foresight.

MARKAL-LV includes mathematical representation of the structure of an energy system in Latvia, including representations of fuel supplies (e.g., coal, oil, natural gas, and renewables), conversion technologies (e.g., boilers that convert coal to electricity and refineries that convert oil to gasoline), end-use technologies (e.g., automobiles, kerosene heaters, and light bulbs), and the end-use demands met by these technologies. MARKAL-LV structure has been adapted in a way that it is possible to calculate the emissions by type of fuel as well as by sector and the respective technology type.

Using MARKAL-LV model, analyses were performed to investigate the effectiveness of various technologies and policies for reducing GHG emissions and RES utilisation. Set of scenarios was developed which includes various RES targets 20/20/20, different GHG emission limits and different energy efficiency policy employment levels.

(3) Results

Comparison of the *Base scenario* costs and other developed scenario costs (see Fig.1), shows that at the current level of technological development mainly use of RES, especially for electricity generation, is still associated with higher costs. Increasing only the proportion of renewable energy results in an overall system price increase but in combination with efficiency measures these costs are partial compensated.

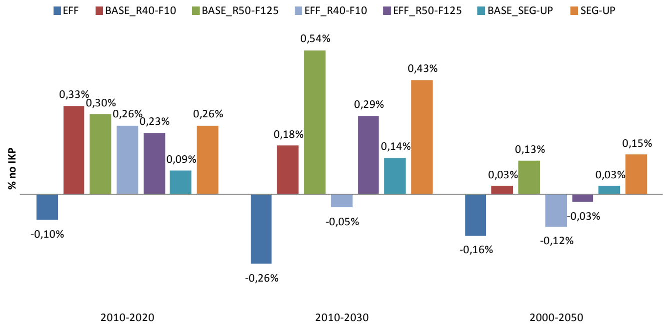

Fig. 1: Cost increase in comparison with GDP

At the current renewable energy technology development level and the expected increases in efficiency and also decrease of investments trend in the foreseeable future, extension of RES use increases the overall system cost. The modelling analysis of the results showed that RES increase at least 40% by the year 2020 scenario cost increase is 0.15% of GDP (average 32 million LVL per year) in relation to the *Base scenario*. These costs are at the same level of GHG emission reduction target for year 2020 the cost of scenario achieving.

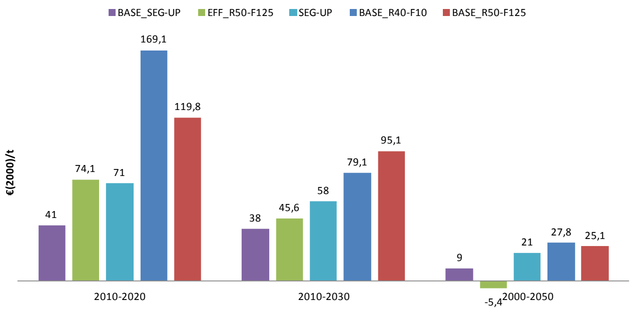

Fig. 2: Average costs of reduced carbon dioxide (CO_2) emissions compared with base scenario

If the scenario costs are discussed in the context of emissions reduction then scenario with a wide range of energy efficiency measures and the increased use of RES is the second cost effective among the simulated scenarios in terms of reducing CO_2 emissions.

(4) Conclusions

Results of the modeling shows that the EU's energy and climate policy package set limits on GHG emissions for Latvia in the year 2020 can be fulfilled reaching targets in the current energy efficiency policy and implementation of a scenario with 40% renewable energy in the total final energy consumption.

If assume that in the period up to year 2030 will be set higher total GHG emission limits in the EU and the Latvia, then an additional energy efficiency policies measures and increasing the proportion of renewable energy to 50% will ensure the fulfillment of this goal.

Comparing and analyzing the results obtained in the various modeled development scenarios can be concluded that more profitable is to create proactive climate policy from long-term cost perspective.

References

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